A DISSERTATION ON

A STUDY ON PANCREATIC PSEUDOCYSTS

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CERTIFICATE

This is to certify that this dissertation entitled "A STUDY ON PANCREATIC PSEUDOCYSTS" submitted by Dr. P. DHANASEKAR appearing for part II M.S. Branch I (General Surgery) Degree examination in September 2005 is a bonafide record of work done by him under my guidance and supervision in partial fulfillment of regulations of The TamilNadu Dr. M.G.R. Medical University, Chennai, TamilNadu, India.

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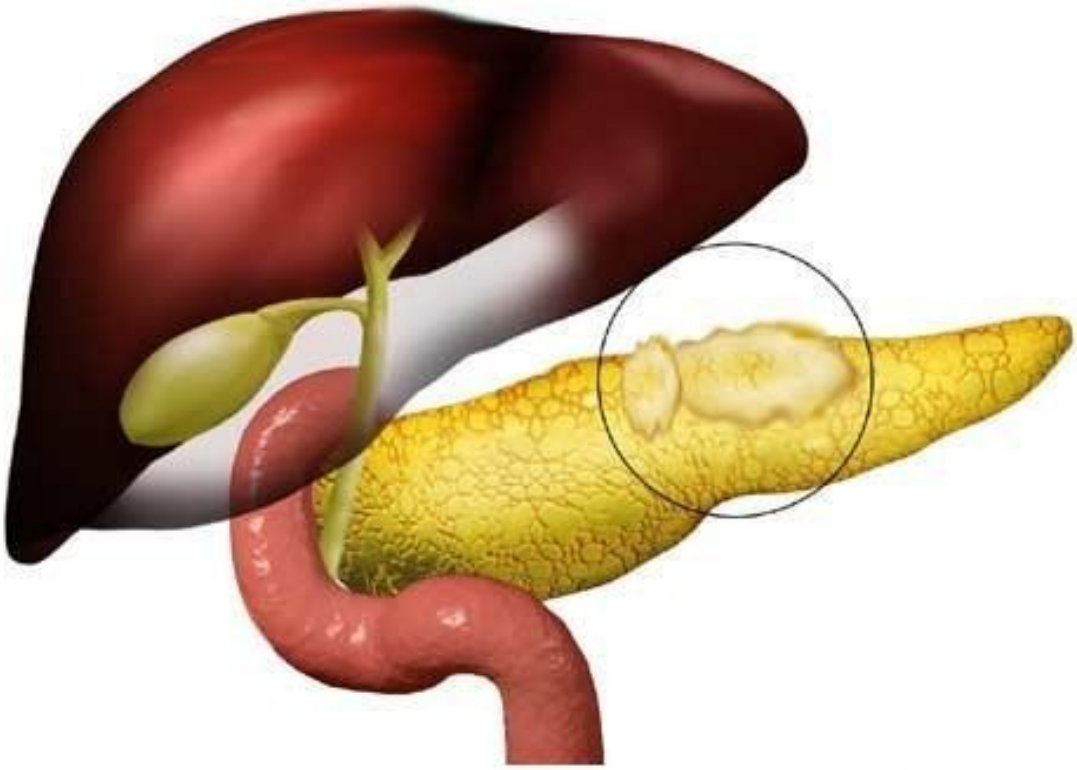


INTRODUCTION

Pancreatic pseudocysts are encapsulated collections of necrotic tissue, old blood and secretions from the pancreas. The prefix “pseudo” is used to emphasize the fact that these collections frequently have no true capsule and that the cyst wall is made up of adjacent viscera such as the stomach and / or colon.

The pseudocysts are the most common complications following pancreatic inflammation both acute and chronic. They also constitute the most frequently encountered cystic lesions of the pancreas others being the cystic neoplasms.

The pseudocysts present clinically as epigastric pain, abdominal masses to jaundice. The laboratory findings are not much of use in the diagnosis of these pseudocysts. It is radiology which helps in the diagnosis of the pseudocysts with the help of USG, CT scan, MRI, etc. These investigations govern the therapeutic procedures to be carried out.

The treatment team for pseudocysts includes radiologists, endoscopists and surgeons. The radiologists by way of guided per-cutaneous techniques for aspiration/drainage to the therapeutic embolization of bleeding aneurysms and

the endoscopists by way of various endoscopic drainage procedures contribute to the team.

The surgeon plays an important and definitive role in the therapeutic team with an array of techniques both open and laproscopically. It is ultimately to provide adequate, dependent drainage of pseudocyst contents before they present with any complications.

This study is carried out to analyze the various etiological factors that lead on to the formation of pancreatic pseudocysts. The various diagnostic and therapeutic procedures available for intervention are also studied and their indications and contra-indications with their advantages compared in this series.

DESCRIPTIOIN

PANCREATIC PSEUDOCYSTS

Pancreatic pseudocyst is a localized collection of pancreatic secretions, surrounded by a wall of fibrous or granulation tissue, which arises as a result of

- Pancreatic inflammation
- Pancreatic trauma
- Obstruction of pancreatic duct by a neoplasm.

Pseudocysts comprise about 75% of cystic lesions of pancreas. They are distinguished from other fluid collections (cystic neoplasms, congenital, parasitic and extrapancreatic cysts) by

- Lack of epithelial lining
- High concentration of pancreatic enzymes within the pseudocysts
- Formation at least 4 weeks after an episode of pancreaitis / trauma.

TERMINOLOGY

As pseudocysts may resemble other collections of fluids that may arise as a complication of acute pancreatitis, clear definitions are to be laid. The present consensus on these has been prescribed in "The International Symposium on Acute Pancreatitis" held in 1992 at Atlanta.

Acute fluid collections:

- Form early in the course of early pancreatitis.
- Lack a discrete wall of fibrous/granulation tissue.
- Occur in 30 to 50% of cases.
- Most regress spontaneously without directed therapy or drainage.
- Most do not represent communication with the pancreatic duct.

Pancreatic Pseudocyst:

- Fluid collection persisting -> 4 weeks.
- Usually surrounded by a well defined wall
- May/may not communicate with the pancreatic ductal system.

Pancreatic Abscess:

- Circumscribed collection of purulent infected fluid containing little or no necrotic material.
- Complication of acute pancreatitis or trauma.

- Occurs late in the course of severe acute pancreatitis, often 4 or more weeks after the onset of symptoms.

ETIOLOGY

Pancreatic psuedocycts occur in 5-10% patients with acute pancreatitis. With improved imaging technique, the prevalence of asymptomatic pseudocysts has been improved. Pseudocysts are believed to occur in 10-20% patients with acute pancreatitis and in 20-40% patients with chronic pancreatitis.

Pseudocysts occur more commonly in males than in females, a finding that perhaps reflects the frequent occurrence of these patients with alcoholic pancreatitis. Alcohol appears to be the cause of 65% of pancreatitis related pseudocysts and gall stones for the origin of the other 15% of the cases.

Trauma in both forms blunt and penetrating can result in psuedocycts formation. In adults, trauma as an etiological factor is seen in around 15-20% of pseudocysts while in children they are the most common cause of pancreatic psuedocyts seen in around 60%.

Pathophysiology

The backgrounds for formation of pseudocyst are mainly three.

(a) Acute pancreatitis.

(b) Chronic pancreatitis.

(c) Abdominal trauma.

The processes by which pseudocysts are formed depend on these factors.

(i) Acute Pancreatitis.

Pseudocysts occurring in the setting of acute inflammatory episodes are called “Acute Pancreatic Pseudocysts”. They occur after acute pancreatitis of any etiology including acute flares of chronic pancreatitis.

Richter has elegantly summarized the pathogenesis of pseudocyst formation. In an acute attack of pancreatitis, there is direct leakage of pancreatic juice from the inflamed area of the gland, which accumulates in a space adjacent

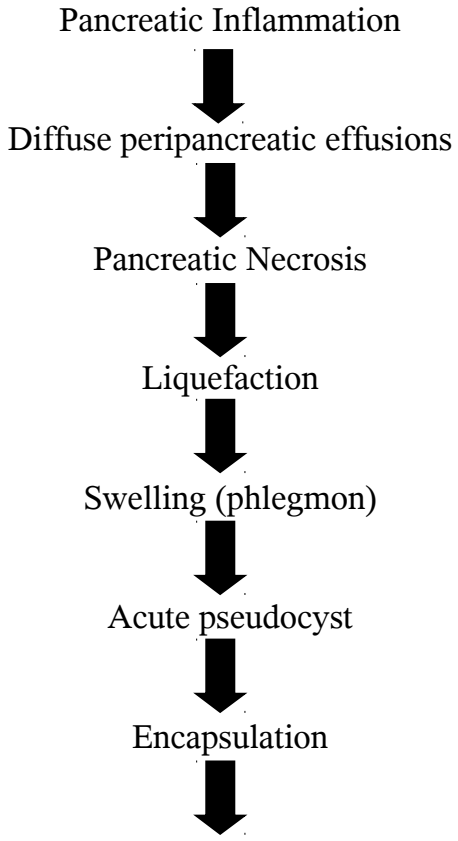
to the pancreas. Ductular disruption is secondary to pancreatic necrosis, even though the attack need not be clinically severe. Since, there is no natural barrier to the dissection this fluid, either cephalad or caudad in the retro peritoneum. Acute pseudocyst may locate anywhere in the mediastinum to the scrotum.

The most common site of accumulation of the leaking pancreatic juice is the potential space of the lesser omentum (lesser sac) limited anteriorly by the stomach, inferiorly by the transverse mesocolon, laterally by the spleen and by the splenic flexure on the left and the duodenum on the right. The evoked inflammatory response induces the formation of a distinct cyst wall composed of granulation tissue and blood vessels, which organizes with more connective tissue and fibrosis. The cyst cavity contains enzymatic fluid and necrotic debris.

Observations supporting the concept that, at it's origin, a pseudocyst must have had a communication with the pancreatic duct are as follows:

- The amylase levels of the aspirated cystic fluid is many times greater than the simultaneous serum levels
- Per cutaneous drainage of pseudocysts results in a prolonged period of drainage indicating a communicating fistula
- Radiologic studies, such as contrast injection into the pseudocyst and ERCP, have clearly demonstated such a communication in two thirds of patients. With time, however, the communication may or may not persist because the inflammatory reaction that follows cyst formation may occlude the fistula.

The algorithm in the formation of acute pancreatitis is as follows.



Maturation

(ii) Chronic Pancreatitis

"Chronic Pancreatic Pseudocysts" are those that are formed in the background of chronic pancreatic inflammations. While acute flare-ups of chronic pancreatitis results in pseudocyst through steps as mentioned earlier, in chronic pancreatitis, the initiating event is duct rupture owing to inspissated proteins, stones or strictures with subsequent blow-out of the pancreatic ducts.

As the pancreatic parenchyma is firm and fibrotic, chronic pseudocysts are commonly located within the substance of the gland. The chronic pseudocyst is virtually impossible to distinguish clinically from pancreatic retention cyst which are formed by progressive dilation of a pancreatic duct distal to an obstruction and also rise in the setting of chronic pancreatitis. The only differentiating feature remains the presence of epithelial lining in the retention cysts. In chronic pancreatitis, pseudocysts are more often seen in those with minimal fibrosis than in those with advanced fibrosis and calculi.

(iii) Pancreatic Trauma

"Traumatic Pancreatic Pseudocysts" are caused by duct disruption secondary to blunt trauma. The duct is usually injured where it crosses the vertebral column and therefore these cysts tend to occur interior of the body of the gland.

PATHOLOGY

Macroscopy:

Pseudocysts can be single or multiple. Most cysts (90%) are single. Multiple pseudocysts are more often seen in acute alcoholic pancreatitis. The size varies from 2 to 30 cms with estimated volumes reported between 50 and 6000ml. Small pseudocysts are often located within the pancreas, with nearly one third located in the head and two thirds in the body and the tail. They are often located outside the pancreas in the lesser sac, where they extend to the adjacent viscera. Extension into transverse mesocolon may occur because of the anatomic relationship of transverse colon to the pancreas. The cysts may also extend to the anterior or posterior para renal space, mediastinum and retroperitoneum.

Posterior pseudocysts, although rare, may extend inferiorly into the pelvic region and groin, and pseudocysts extending to the scrotum have been encountered. The cysts are often smooth and rounded. Thick granulation tissue separates the cysts from the surrounding structures.

The cyst contents have been well studied. The fluid may be clear and watery or xanthochromic or brown because of old blood and necrotic tissue. The amylase, lipase and trypsin contents are usually markedly elevated, and it is exceptional to find amylase activity lower than serum levels.

The amylase level may decrease in some pseudocysts in existence for a long time. It is hypothesized that the cyst may have lost it’s communication with the ductal system coupled with the possibility that the fluid in the cyst

exchanges with the plasma. The aforementioned mechanism also explains spontaneous disappearance of small pseudocysts.

Microscopy:

The cyst wall characteristically is composed of granulation and fibrous tissue without an epithelial lining. In an acute pseudocyst, usually four zones can be distinguished in the wall.

Zone 1 - Hemosiderin pigment and loose connective tissue

Zone 2 - Inflammatory cells and capillary-rich fibrous tissue

Zone 3 - Hyalinized acellular connective tissue

Zone 4 - Capillary-rich fibrous stroma.

The pseudocyst wall is a dynamic structure associated with a series of continuous biologic changes. The histology of the wall varies according to the age of the pseudocyst. Older cysts have thicker walls with increased collagen, fibronectin and smooth muscle content. The histologic appearance is independent of the cause with no differences in the structure of the walls between alcoholic and biliary pancreatitis and idiopathic pancreatitis.

CLASSIFICATION

Modern imaging techniques, including USG, CT and ERCP have provided a clear understanding of the different types of fluid collections associated with pancreatitis and have led to a working classification to assist in the timing and choice of treatment. A classification put forward by D'Egido and Schein is:-

Features	Type I a	Type I b	Type II
1. Antecedent	Post Necrotic	Acute on chronic	Chronic
2. Loaction	Extra-pancreatic	Mostly extra-pancreatic	Intra-pancreatic
3. Site	Lesser Sac	Lesser Sac	Head
4. Cyst Wall	Immature/Mature	Immature/mature	Mature
5. Content	Necrotic/Liquefied	Pancreatic Juice	Panreatic juice
6. Colour	Pus like/black	Clear/Prune	Clear
7. Duct communication	~30%	~60%	100%
8. Risk of Sepsis	High	Moderate/Low	Low

CLINICAL PRESENTATION

Abdominal pain:

According to Crass and Becker, epigastric pain is the most common symptom in patients with a pseudocyst. It occurs in upto 90% of patients. Pseudocysts that follow an episode of acute pancreatitis are often characterized by the persistence or recurrence of upper abdominal pain weeks after the initial attack.

A pseudocyst may also be the source of increased or refractory pain in a patient known to have chronic pancreatitis.

The other common symptoms include:

- Nausea and vomiting (50-70%)
- Weight loss (20-50%)
- Abdominal Fullness (40%)
- Jaundice (10%)
- Low Grade fever (10%)
- Early satiety

The symptoms of early satiety, nausea and vomiting may be secondary due to mass effect of the pseudocyst that causes gastro-duodenal obstruction. Obstructive jaundice due to extraneous biliary tree compression may be presenting complaint in 10% of patients.

Rarely, patients with pseudocysts may not present until a secondary complication occurs. These complications include

- Sepsis secondary to infection
- Hypovolemic shock secondary to pseudocyst – associate hemorrhage.
- Jaundice secondary to CBD obstruction
- Severe acute abdominal pain secondary to intra-peritoneal rupture of pseudocyst.

Patients with pseudocyst secondary to trauma may present with similar symptoms, at a time remote from the trauma. So they are likely to have a mature wall at diagnosis.

Physical Findings:

The sensitivity of physical examination findings is limited.

Patients very frequently have a tender abdomen.

Patients occasionally have a palpable mass in the abdomen. The absence of a mass does not exclude the diagnosis of pseudocysts, even large ones can be hidden by the coastal margins

Peritoneal signs suggest rupture of the cyst or infection.

Other possible findings include the following:

- Fever
- Scleral icterus
- Pleural effusion

DIAGNOSIS

Laboratory Parameters

No laboratory findings are available to establish a diagnosis of pancreatic pseudocyst. Elevated serum amylase and lipase concentrations may occur in half these patients. In fact, a persistently elevated amylase, after resolution of acute pancreatitis should prompt investigation for a pseudocyst. Aspirated pseudocyst fluid may be useful to differentiate between the various pancreatic cystic lesions.

A few parameters which are useful to this are:-

Types of Cystic Lesions	Viscosity	CEA	CA 125	CA 15-3	CA 72-4	Amylase	Cytology
1.Pseudocyst	Low	Low	Low	Low	Low	High	Negative
2.Serous Cystadenoma	Low	Low	Low	Low	Low	Variable	Negative
3. Benign mucinous cystic neoplasms	Usually High	High	Low	Low	Low	Variable	Usually positive
4.Mucinous Cystadeno carcinoma	High	High	High	High	High	Variable	Usually positive

A few patients with a pseudocyst have mild leucocytosis, whereas others have elevated liver function tests, indicative of some biliary tree obstruction.

Radiological Investigations

USG: It is a simple non-invasive investigating modality which helps in the diagnosis of pancreatic pseudocysts. Hessel et al. found ultrasound to be 90% accurate and 98% specific in the diagnosis of pseudocysts but the pancreas could not be visualized because of bowel gas or other technical problems in one-third of their patients. The usefulness of ultrasound as an initial diagnostic test is also limited by its inability to provide crucial information regarding adjacent structures, maturity of cyst wall and retro-peritoneal extension of the fluid collection. It still is an excellent modality for diagnosis and following the progress of the course of pseudocysts as it is less costly and does not expose the patient to ionizing radiation.

Abdominal CT scan: CT scan is the standard imaging criterion for pancreatic pseudocysts. It has a sensitivity of 90 -100% and is not operator dependent.

The usual finding on CT scan is a large cyst cavity in and around the pancreas. Multiple cysts may be present. The pancreas may appear irregular or have calcifications. Pseudoaneurysms of the splenic artery, bleeding into a pseudocyst, biliary and enteric obstruction, and other complications may be noted on CT scan. The CT scan provides a very good appreciation of the wall thickness of the pseudocyst, which is useful in planning therapy.

ULTRASOUND - PANCREATIC PSEUDOCYST

CT – PANCREATIC PSEUDOCYST

MRI: MRI is not necessary for the diagnosis of pseudocysts; however, it is useful in detecting a solid component to the cyst and in differentiating between organized necrosis and a pseudocyst. A solid component makes catheter drainage difficult; therefore, in the setting of acute necrotizing pancreatitis with resultant pseudocyst, an MRI may be very important before a planned catheter drainage procedure.

Conventional MRI also has the potential advantage of being coupled with magnetic resonance, cholangio-pancreaticography (MRCP) to help define pancreatic ductal anatomy relative to a pseudocyst.

ERCP: It demonstrates abnormalities of the pancreatic duct in upto 90% of the patients with pseudocysts. Nearly two-thirds of pseudocysts communicate with the pancreatic duct. Obstructions of the pancreatic duct, compression of the duct by the cyst or changes consistent with chronic pancreatitis are frequently noted. It can help define the anatomic relationship between the cyst and the pancreatic duct and plan the extent of anastamosis or resection before surgery.

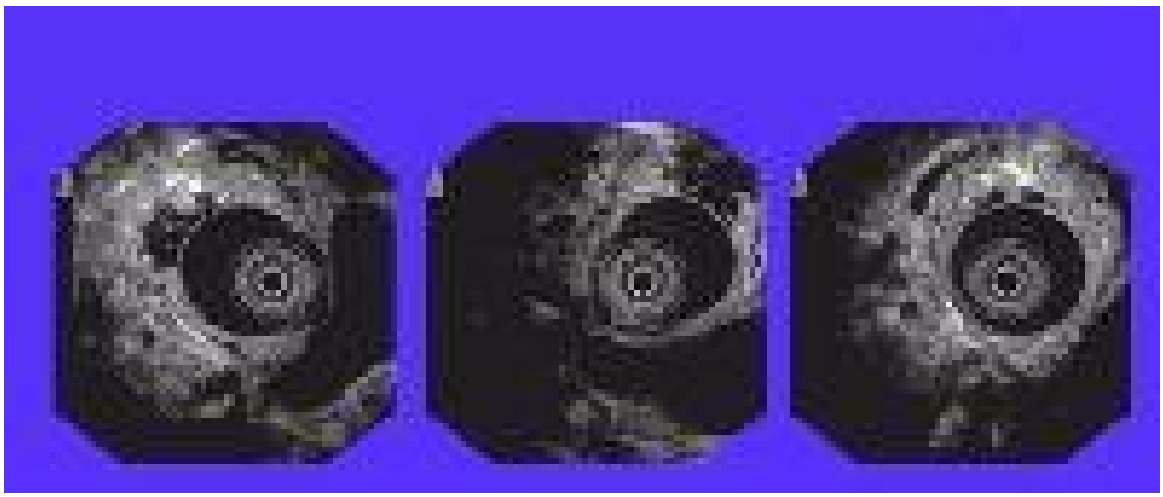
ERCP is an invasive procedure that potentially could aggravate pancreatitis or introduce infection into the pseudocyst in spite of the prophylactic antibiotics. Thus, it is proposed that if ERCP is to be used, especially in patients with large pseudocysts, it should be performed within 24-48 hours of a planned drainage procedure.

Endoscopic ultrasound (EUS): It is not necessary for diagnosis but is very important in planning therapy, particularly if endoscopic drainage is contemplated.

A gastric wall with a thickness greater than 1 cm next to the cyst tends to predict a poor outcome with endoscopic drainage. EUS may also be helpful in detecting small portal collaterals from otherwise undetected portal hypertension that may increase bleeding risks with transmural drainage. Transmural drainage may be performed only when the symptomatic pseudocyst is positioned next to the gut wall.

Pseudocysts appear as anechoic, fluid-filled structures adjacent to the UGI tract and the pancreas. Fluid collections associated with acute pancreatitis will not be surrounded with a well-defined wall, whereas a thick, hyperechoic rind often surrounds pseudocysts. Calcifications within the wall are rare. Within the pseudocyst cavity is fluid without air. Debris in the dependent portion of the cavity is common and may represent blood, infection, or necrotic material. Color Doppler of the wall will often reveal multiple, prominent vessels, including para-gastric varices. Evaluation of suspected pseudocysts with EUS prior to drainage is important for confirming the diagnosis, determining the precise location, and determining the thickness of the pseudocyst wall. Catheter probe endosonography can also be used to localize pseudocysts.

EUS – PANCREATIC PSEUDOCYST



Arteriography: It is generally not useful for diagnosis of pseudocysts nor should it be necessary in the pre-operative evaluation of pseudocysts. However, in patients who have had bleeding complications from pseudocyst or those who have portal hypertension, it may provide valuable information that can alter the surgical approach. The finding of splenic vein thrombosis with left sided portal hypertension is an indication of splenectomy in patients undergoing operation for drainage of pseudocysts.

MANAGEMENT

The management options available for pancreatic pseudocyst are:-

- Observation
- Percutaneous aspiration / drainage
- Endoscopic procedures
- Operative approaches (open/ laparoscopy)
    - ❖ Internal drainage
    - ❖ External Drainage
    - ❖ Resection

Conservative

More than 50% of patients can be expected to require no interventions except observations with regular follow-ups. To qualify for conservative, non-operative management, patients should have no symptoms referable to the pseudocyst, no pseudocyst related complications and a stable or decreasing pseudocyst size.

The medical treatment of acute pseudocyst is essentially that of acute pancreatitis, including parenteral nutrition to minimize stimulation of pancreas. Pancreas secretory suppression with somatostatin has been beneficial in the treatment of pancreatic ascites and in theory should encourage the healing and resolution pseudocysts by reducing secretions which fills the cysts. Patients

who do not meet any of these criteria at follow-up evaluation should undergo appropriate intervention.

Percutaneous aspiration/Drainage

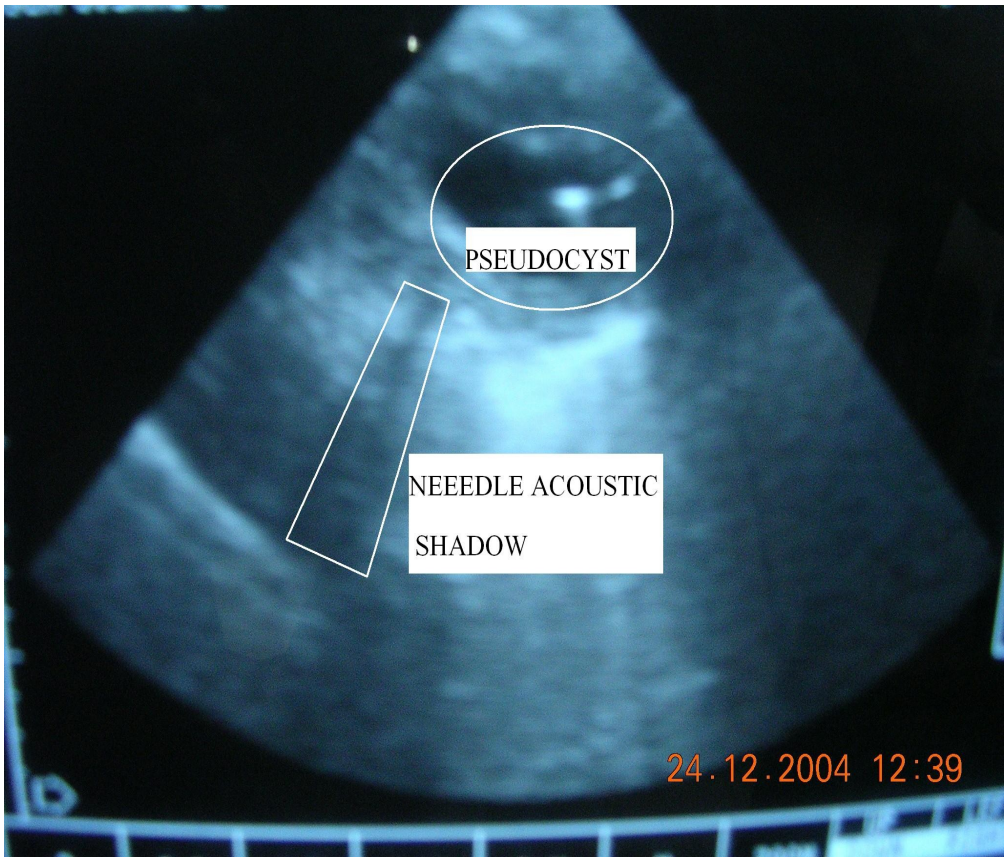
Percutaneous aspiration is aimed at aspirating all pseudocyst fluid at one procedure without leaving indwelling catheter drainage. It has not been widely used as a definitive procedure as the risk of recurrence is particularly high due to persistent communication with the pancreatic duct. However, this method can be utilized as a therapeutic procedure in pseudocysts where sepsis is suspected or for rapidly expanding collections to avoid the risk of ruptures, and in type I-b collections, when no pancreatic duct leak has been demonstrated on ERCP.

Percutaneous catheter drainage involves placement of an indwelling catheter into a pseudocyst by the Seldinger technique using USG or CT guidance. The pseudocyst is normally entered through a flank or transgastric approach and the tract may be dilated to accept a catheter ranging in size from no.7 to no.14 French. These catheters are typically irrigated or flushed with small amounts of saline two or three times a day to ensure patency and they are left to drain by gravity drainage to an attached bag.

Contra indications through percutaneous drainage include the presence of significant pancreatic necrosis or solid debris in the pseudocyst, lack of safe access route, pseudocyst hemorrhage and complete obstruction of the main pancreatic duct. Complications associated with the procedure are infection of

the drain tract, persistent or recurrent pseudocyst and pancreatico-cutaneous fistula.

USG GUIDED ASPIRATION



Endoscopic procedures

The endoscopic techniques used for drainage of pseudocyst include:-

- Transpapillary cyst drainage (TCD)
- Transmural endoscopic cyto-gastrostomy (TECG)
- Endoscopic cysto duodenostomy.

Transpapillary drainage: While safer and more effective than transmural drainage, this technique requires cyst communication with the pancreatic duct. This technique may be technically challenging because it requires wire passage and stenting through the pancreatic duct to the pseudocyst. The success rate is about 80%. The recurrence rate is 10-14%, and, in most series, the complication rate (mainly pancreatitis) is approximately 13%. It is possible when a communication exists between the pancreatic duct and the pseudocyst,

it is ideal in cases of associated proximal duct obstruction that is closed to the papilla. Technically demanding TDC required advancing a co-axial guide wire system beyond the strictures or stones and placing the stent either into the cyst or beyond the site of the leak.

Transmural pseudocyst Drainage: Most widely used endoscopic technique for drainage. Only pseudocysts involving the pancreatic head or body are suitable for endoscopic procedure. The distance between the pseudocyst cavity and the gastric or duodenal lumen must be less than 10mm as measured by CT or endoscopic USG.

The technique of transmural drainage is similar for endoscopic cysto-duodenostomy and cysto-gastrostomy. A side viewing scope is used to identify the site of maximal bulge and a needle knife is used to make a small diathermy incision to enter the pseudocyst. The catheter is then advanced into the cavity through the puncture site to facilitate the subsequent placement of the stent.

The choice of cyst drainage either into the stomach or duodenum is determined by the area where the bulge into the bowel lumen is most prominent. The duodenum is usually preferred as its mucosa and duodenal wall is generally thinner and less risk is seen of bleeding from sub-mucosal vessels.

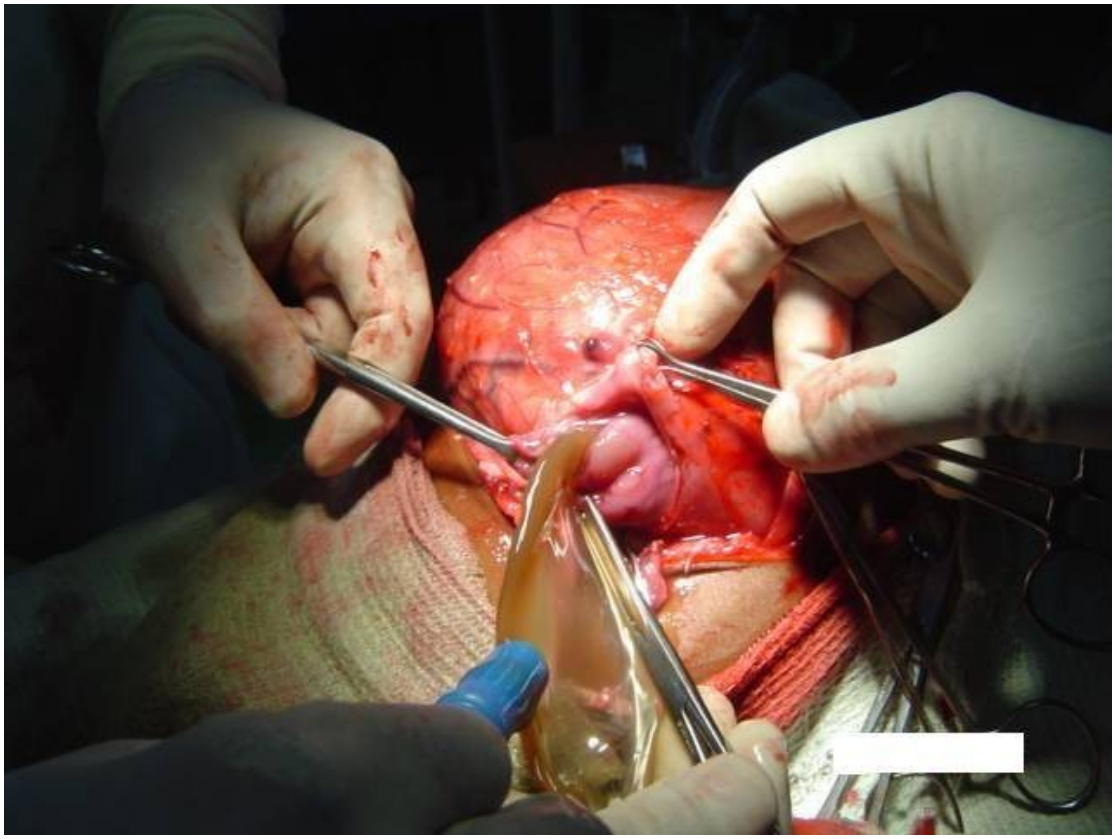
This method has an 82-89% success rate in very experienced hands. The recurrent rate is 6-18%. The complication rate is 20%, with the most feared complication being bleeding.

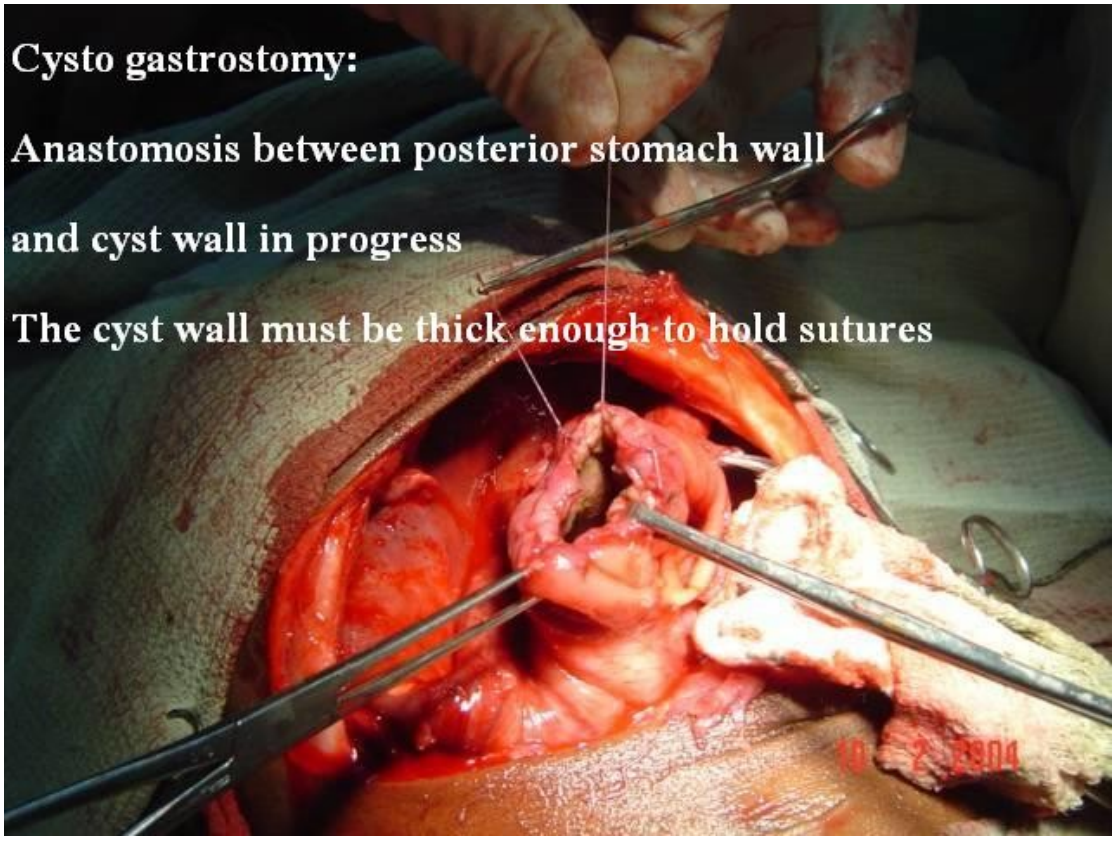
SURGICAL PROCEDURES

Internal Drainage: The preferred approach for most uncomplicated pseudocysts requiring surgical intervention is internal drainage. Mature cyst can be drained into the stomach, duodenum or small bowel. The surgical procedure is chosen depending on the location of the pseudocyst and the local topography.

(1) Cystogastrostomy

Cyst adherent to stomach is ideally drained by a cysto gastrostomy. After ascertaining that the cyst is firmly adherent to the stomach, an anterior gastrotomy is made. Pseudocyst confirmed by aspiration and an incision as long as possible is made through the posterior gastric wall into the pseudocyst. A small ellipse of common posterior gastric and cyst wall is excised and sent for frozen section examination to exclude neoplasia. Septations within cyst are broken down and haemostasis along cut edges is achieved with closely interrupted non-absorbable sutures to approximate the gastric wall and the pseudocyst.




Cysto gastrostomy:
Anastomosis between posterior stomach wall
and cyst wall in progress
The cyst wall must be thick enough to hold sutures

(2) Cystoduodenostomy

Procedure similar to cysto gastrostomy and is used for pseudocysts in the pancreatic head or uncinate process that lie within 1cm of duodenal lumen.

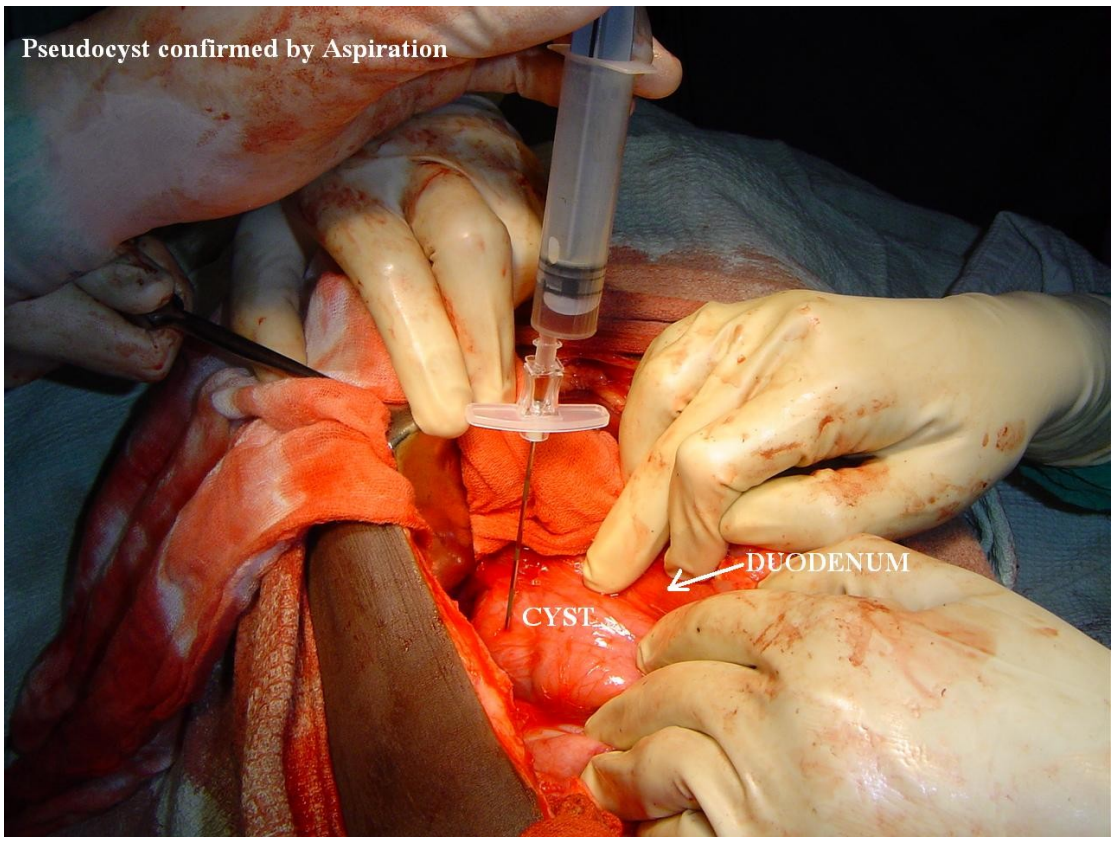
(3) Cystojejunostomy

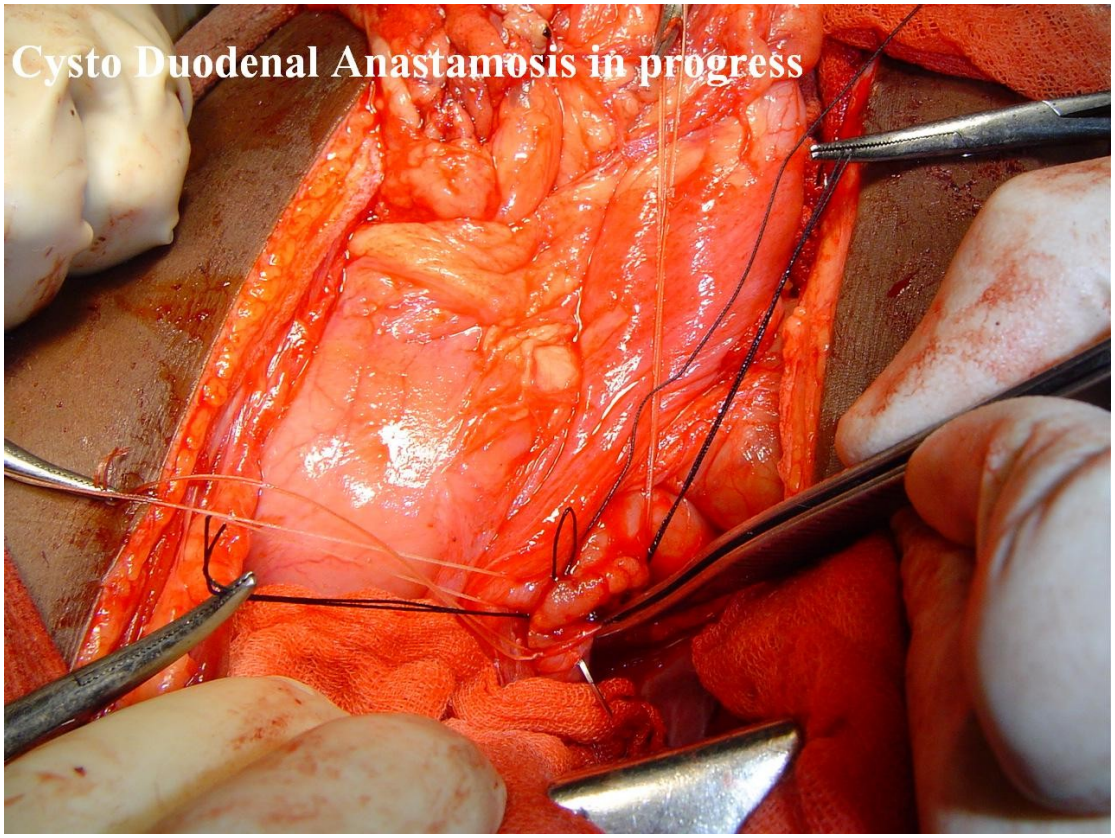
Most versatile technique of operative drainage and is appropriate when a pseudocyst is located at the base of transverse mesocolon and is not adherent to posterior gastric wall. One important difference from other procedure is that this is a double layered anastamosis.

External Drainage

Indicated when gross infection is found at the time of operation or when an immature, thin walled pseudocyst is encountered that will not allow for safe internal drainage. The contents of pseudocyst cavity are then completely evacuated and at least one closed suction drain is placed into the cavity and is brought out through the abdominal wall. Appropriate antibiotic therapy should be instituted and follow up CT / USG obtained to ensure that the pseudocyst is entirely drained.

CYSTO DUODENOSTOMY





Resections

A small proportion of pseudo cysts are best treated by pancreatic resections. More commonly this operation involves distal pancreatectomy for pseudocysts located in the body (or the tail of the gland). After distal pancreatectomy a Roux – en – Y pancreatiocojejunostomy to the remnant pancreas may be required to decompress an obstructed or abnormal pancreatic duct. In a few patients with symptomatic pseudocysts in the head of the pancreas, associated with an inflammatory mass, excisional therapy may require pancreaticoduodenectomy. In this case, pylorus preserving pancreaticoduodenectomy is the procedure of choice.

COMPLICATIONS

- Bleeding is the most feared complication and is caused by the erosion of the pseudocyst into a vessel. Consider the possibility of bleeding in any patient who has a sudden increase in abdominal pain coupled with a drop in hematocrit level or a change in vital signs. Therapy is emergent surgery or angiography with embolization of the bleeding vessel. Do not perform a percutaneous or endoscopic drainage procedure under any circumstances in patients with suspected bleeding into a pseudocyst.
- Consider the possibility of infection of the pseudocyst in patients who develop fever or an elevated WBC count. Treat infection with antibiotics and urgent drainage.
- GI obstruction, manifesting as nausea and vomiting, is an indication for drainage.
- The pseudocyst can also rupture. A controlled rupture into an enteric organ occasionally causes GI bleeding. On rare occasions, a profound rupture into the peritoneal cavity causes peritonitis and death.

REVIEW OF LITERATURE

In 1979, Bradley et al followed acute fluid collections in pancreatitits by ultrasonogram and suggested that cysts present for less than 6 weeks had a 40 % spontaneous resolution rate, whereas those which were present for longer almost never resolved (*Am. J Surg*. 137 : 135, 1997)

Experimental studies by Warren et al first suggested that it takes 6 weeks for the formation of a mature cyst wall, and this figure has become accepted as a guideline.

According to Crass and Becker, epigastric pain is the presenting complaint in 90 % patients with pancreatic pseudocysts. Nausea and vomiting were present in nearly half of the patients and weight loss was present in 40%. As many as 60 % of patients had an epigastric mass and fever. Jaundice may also be part of the examination. (*Am. Jour. Surg*. 1984; 142: 660).

Warshaw and Rattner have reported that appearance in the pseudo cyst and in the blood stream of an amylase isoamylase (old amylase) is a reliable marker of cyst wall maturity.

Levandrowski and colleagues evaluated the intracystic fluid from 26 cystic lesions for amylase content, cytology, relative viscosity and serologic markers CEA and CA- 125. He found elevated levels of amylase in pseudocyst fluid while CEA and CA-125 were absent in them (Ann. *Surg*. 1983; 217:41)

Hessel found ultrasound to be 90 % accurate and 98 % specific when the pancreas could be visualized. Unfortunately, gas shadows obscure the pancreas in nearly one third of the patients.

Ahearne et al in a 1992 study has suggested that those pseudo cysts which have communication with the duct as shown by ERCP should be treated with surgical drainage or resection, whereas those which do not communicate may be drained per cutaneously. (*Am. Journ. Surg*. 1992; 163:111)

Gullo and Barbara used somatostatin as the primary therapy for pseudocysts. They treated seven patients with pseudocysts with octreotide (100mg three times a day for 2 weeks). Four of the seven demonstrated a decrease in size. More significantly, there was a definite decrease in the intensity of pain. (*Lancet* 338:540-541, 1991).

In 1997, Gouyton et al, reviewed 90 patients with pseudocysts and found that cyst size > 4 cm, cyst enlargement and extra pancreatic involvement were independent predictive factors for non resolution and complications of pseudocysts.

A recent series published by Yeo et al indicated that cyst size is the primary determinant of the success of expectant treatment. In this series, 75 patients were observed, with surgery being reserved for those with cyst enlargement, abdominal pain and complication. Of this group, 48 % were managed expectantly, whereas 52% required surgery. When the two groups were compared, the only significant difference was that of cyst size (7.4 + 0.6 cm versus 5.8 + 0.8 cm) . (*Curr. Prob. Surg*. 31: 165, 1994)

Boettger et al in a series of 145 patients who were internally drained, reported a recurrence rate of 10 % He stressed the importance of anastamosis sufficiency that is at least 3 to 4 cms in diameter. Otherwise, recurrence is possible because of the premature closure of a small anastamosis between the cyst cavity and the stomach or intestinal limb.

One study attempted to determine which factors could predict successful pseudocyst with percutaneous aspiration. Patients with pseudocysts in the tail of the pancreas, with pseudocysts with total volumes less than 100ml and with low intracystic amylase levels appeared to be the best candidates for per cutaneous aspiration according to this study of 67 patients.

After 62 per cutaneous drainage procedures done in 42 patients with pseudo cysts, Cradio et al reported 33 treatment failures (i.e. persistent or recurrent pseudo cyst) during a mean follow up of 10 months. (*Surg. Obstet. Gynaec*.1992; 175:293)

A few reports on per cutaneous drainage of non- infected pseudocysts:

Author	**Cases (n)**	**Drainage duration (days)**	**Compln.**	**Fistula**	**Success (%)**	**Follow up (months)**
Matzinger et al	12	11-47	0	0	100	ns
Van sonnenberg et al	50	17	ns	6	66	8-48
Grosso et al	42	ns	2	0	67	27
D'Egidio & Schein	23	11-47	1	0	67	ns
Adams & Anderson	52	42	5	1	81	ns

ns – Not Significant

Lo and Rowe in their review of the endoscopic management of pancreatic pseudo cysts found a 16% recurrence rate, 20% complication rate and 17% of the patients needed an additional non endoscopic, mostly surgical intervention. (*Gastroenterologist* 1997; 5:10)

In 1997, Berckingham et al reported a 62 % long term success rate of endoscopic internal drainage. In their series, patients who had a wall fusion thickness of < 1 cm and whose cysts were bulging into the stomach and duodenum were shown to be ideally suited for endoscopic treatment (*Br. Journ. Surg.* 1997; 84:1638)

Weckman reported an approximately 86% success rate with endoscopic drainage with a 10% complication rate and a 14% failure rate. There appeared to be about a 15% recurrence rate. There was no real difference in outcome in patients treated with a transpapillary or transmural approach.

The only prospective study comparing per cutaneous and operative interventions in comparable patients to date has been by Lang and colleagues. In this study, patients were alternately assigned to either per cutaneous or operative drainage. Both procedures have similar rates of success with 88 % of pseudocysts ablated by operative management and 77 % through per cutaneous drainage. (*South Med. Journ*. 1991; 84:55)

A study by Berrns et al, showed a 42 % success rate treating pseudocysts by per cutaneous drainage compared with an 88 % success rate for those treated with surgical internal drainage. He also reported a significantly

higher complication rate with per cutaneous drainage when contrasted to surgical drainage (64 % versus 27%)

Newell et al comparing cystojejunostomy with cystogastrostomy found similar post operative morbidity, mortality and recurrence rates but noted that cystogastrostomy was performed more quickly and with less blood loss.

Though cystogastrostomy has been advocated by many authors because of its technical advantages, Johnson et al reported life threatening post operative complications and 2 deaths, in patients with large pseudocysts (> 15 cm) who were treated with the procedure. These complications were attributed to incomplete emptying of the pseudocysts, a finding emphasizing that complete dependent drainage is critical in any internal drainage procedure and solid materials lining a pseudocysts should be thoroughly debrided at the time of internal drainage.

AIMS OF THE STUDY

- To understand the epidemiology of pancreatic pseudocysts.
- To analyze the various treatment modalities that can be utilized in the management of the pancreatic pseudocysts
- To try USG guided aspiration technique as a primary modality of treatment in pancreatic pseudocysts before other therapeutic interventions.
- To compare USG guided per-cutaneous aspiration with the other treatment options available in terms of patient and physician factors.

MATERIAL AND METHODS

Place of Study : Madras Medical College and Government Hospital, Chennai.

Period of Study : Aug 2003 to March 2006.

Type of Study : Prospective

Selection Criteria : Patients were selected with symptomatic pseudocysts from the Department of General Surgery, GGH.

The patients included in the study were to satisfy the following criteria:-

- Prior consent to be obtained.
- Pseudocysts with greater than or equal to 6 weeks duration were involved in the study.

No. of patients studied : 40

Methods:

The selected patients were subjected to a detailed history elicitation followed by thorough evaluation of risk factors and clinical features.

They were then subjected with baseline investigations (Biochemistry, Haemogram, and Chest Skiagram). This was then followed up by specific investigations like serum amylase, liver function tests, USG – Abdomen and CT – Abdomen.

Each patient was individualized and treated accordingly. The outcomes were documented.

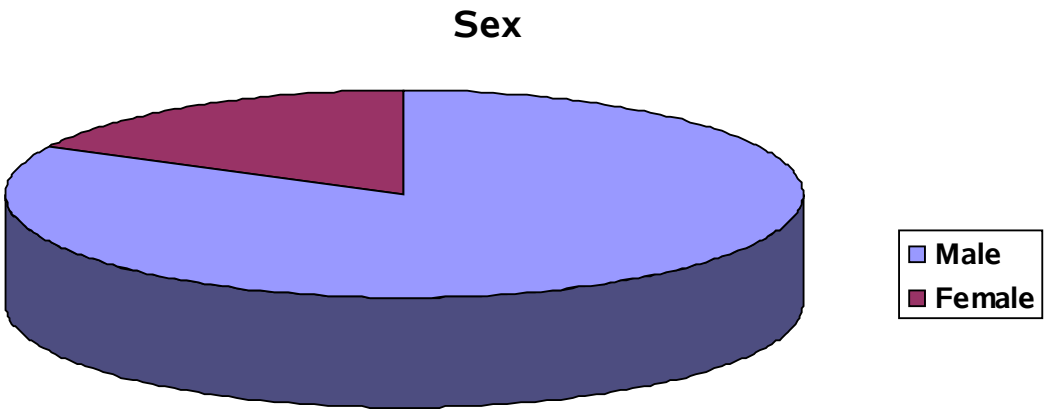
OBSERVATIONS AND RESULTS

A total of 40 patients with symptomatic pancreatic pseudocysts were included in this series. All subjects satisfied the inclusion criteria. The results obtained from the study can be discussed as follows.

Sex:

Among the 40 patients, 7 patients were females and the remaining 33 males.

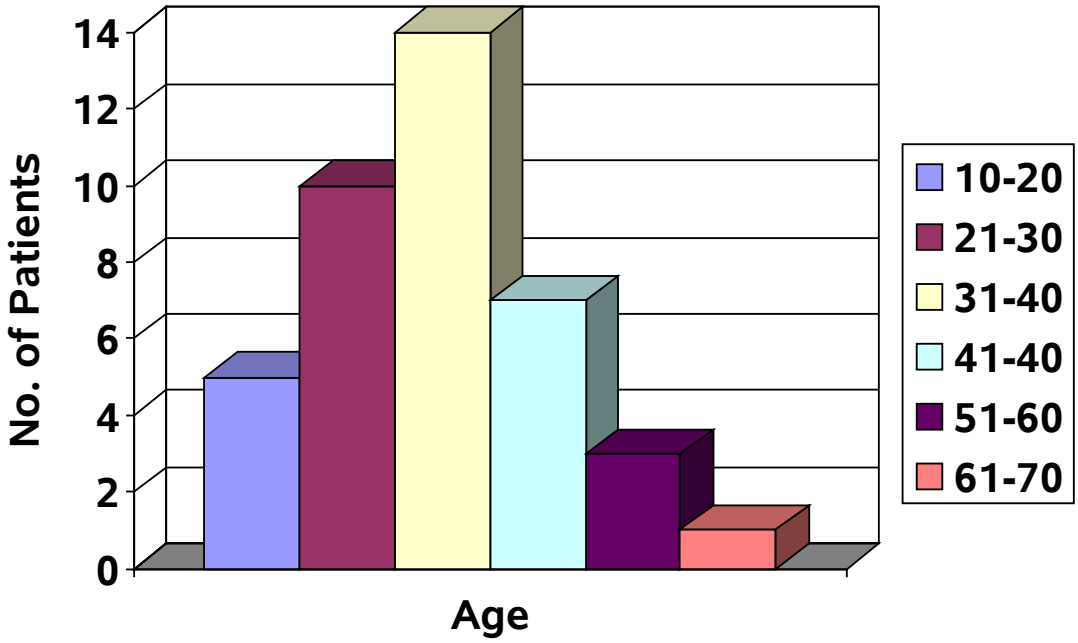
Total	Male	Female
40	33 (82.5%)	7 (17.5%)



Age Groups:

The subjects were mostly in the 3rd to 4th decade of life.

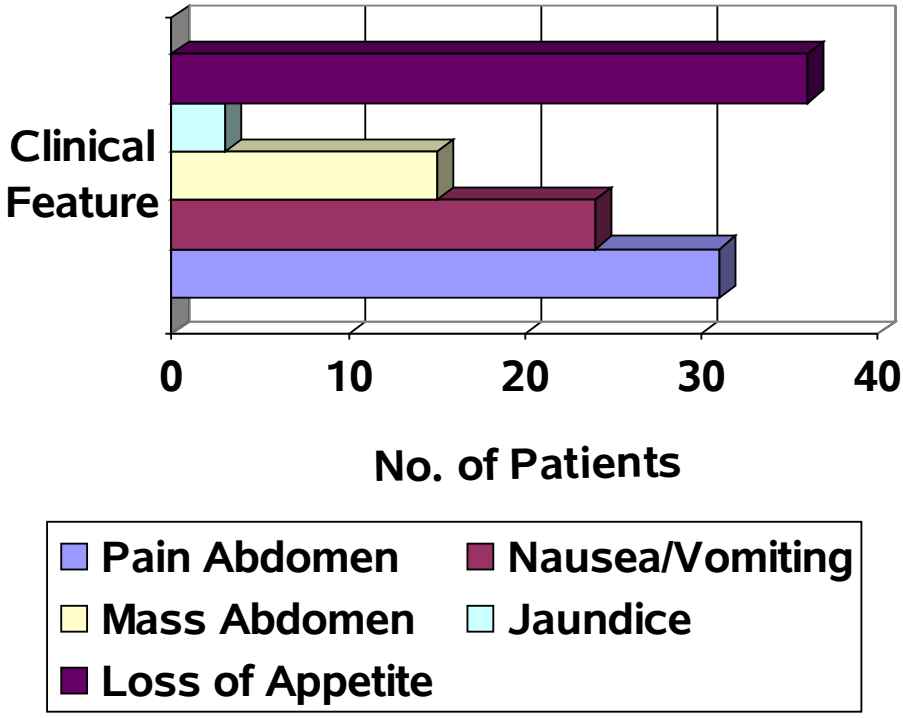
Age	No. of patients	Percentage %
10-20	5	12.5
21-30	10	25
31-40	14	45
41-50	7	22.5
51-60	3	7.5
61-70	1	2.5



Clinical Features:

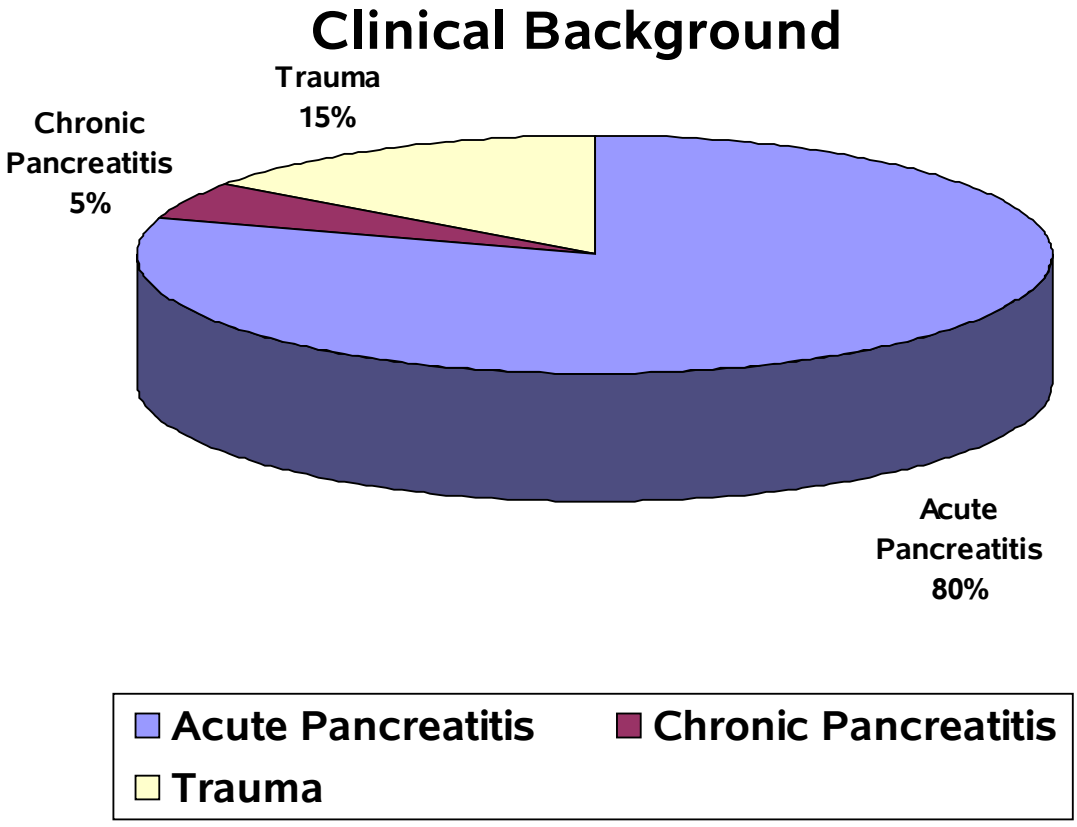
The clinical presentations of the patients were pain abdomen, nausea , vomiting, loss of appetite, mass abdomen and jaundice. Among these, loss of appetite was the predominant symptom followed by pain abdomen.

Clinical Feature	No. of patients	Percentage %
Pain Abdomen	31	77.5
Nausea / vomiting	24	60
Mass Abdomen	15	37.5
Jaundice	3	7.5
Loss of appetite	36	90



Clinical Background:

Pancreatic pseudocysts in the setting of acute pancreatitis were found in 32 of the patients. Chronic pancreatic pseudocysts were found in just 2 of the subjects. Trauma was the etiological agent in the remaining 6 patients.



Among the patients with acute pancreatic inflammation, alcohol contributes to the majority of cases accounting for 27 of the 32 patients. In 4 patients, etiology for acute pancreatitis could not able to be elucidated. Only 1 case of gallstone pancreatitis was encountered.

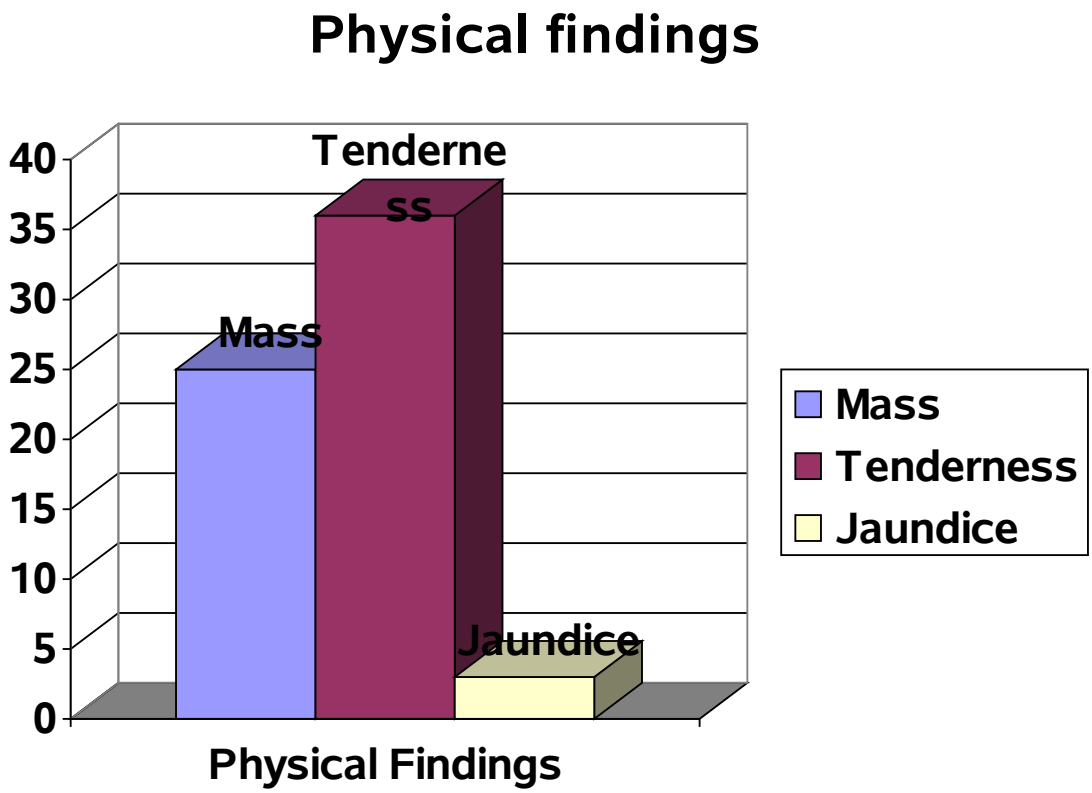
Physical Findings:

The three clinical features which were studied were:

- Tenderness
- Mass Abdomen
- Jaundice

The results are tabulated as below:

Physical Findings	No. of Patients	Percentage %
Mass	25	62.5%
Tenderness	36	90%
Jaundice	3	7.5%



Lab Findings:

Only two parameters, namely serum amylase and liver functions were studied in this series.

Serum amylase showed normal values in 14 subjects and in the remaining subjects showed mild to moderate levels of increase.

Liver function tests were elevated in only 5 of the subjects (12.5%).

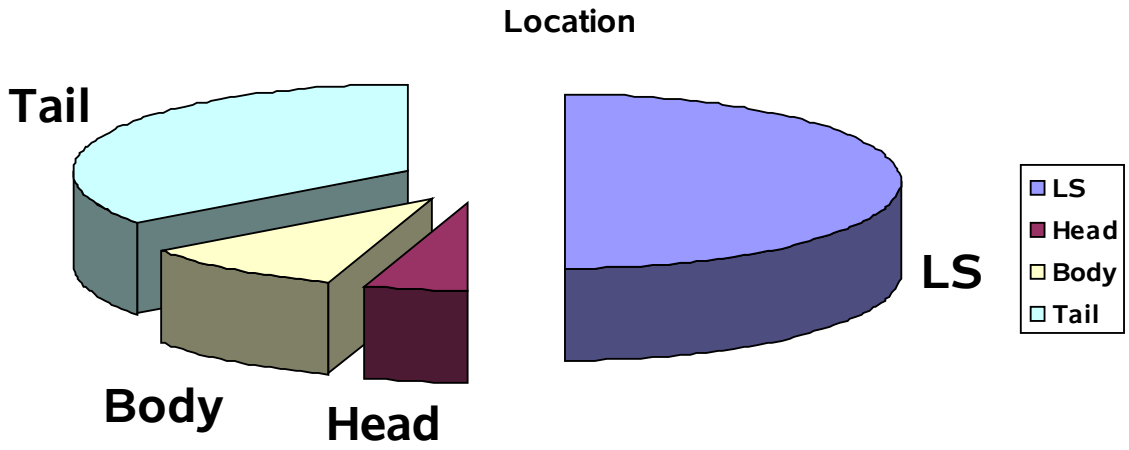
USG / CT Findings:

Location:

The study showed that lesser sac is the most common site for pancreatic pseudocysts in 20 of 40 subjects (50%). The head, body and tail of the pancreas was found to be the locations in 2, 4 and 14 subjects respectively.

Location	No. of Patients	Percentage %
L.S.	20	50

Head	2	5
Body	4	10
Tail	14	35



Size:

The longest diameter of the pseudocyst was taken into account.

Size	No. of Patients	Percentage %
3 – 6	27	67.5
7 – 9	7	17.5
10 – 12	6	1.5

Treatment:

Three treatment modalities were studied in this series. They were:

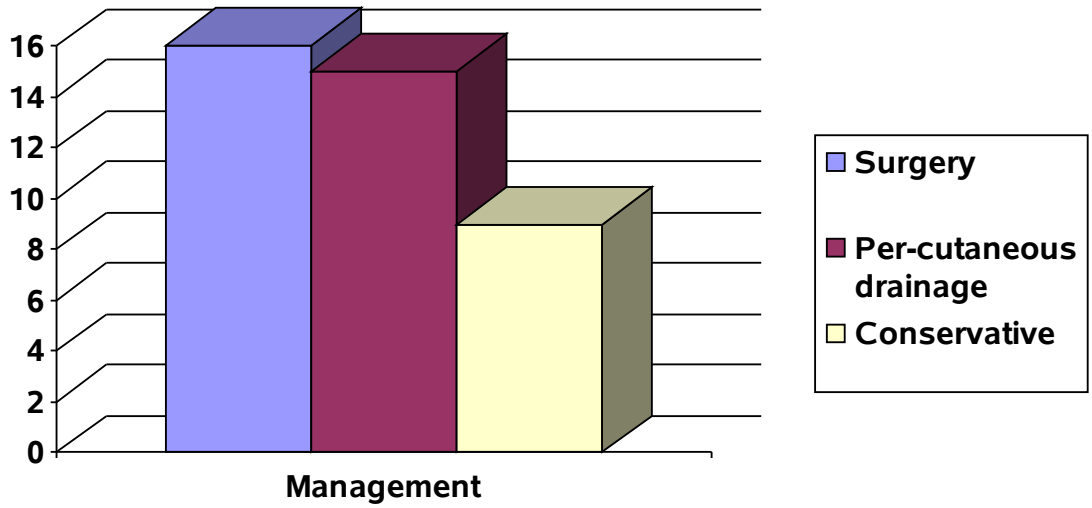
a) Conservative

b) USG guided percutaneous technique

c) Surgical procedures

Nine patients showed resolution of pseudocysts by conservative line of management. 15 patients were treated by percutaneous techniques while 16 patients were taken up for surgical intervention.

Surgery	Per-cutaneous drainage	Conservative
16	15	9



<u>Conservative Management</u>:

Among the 9 patients who were treated expectantly, 8 patients had acute pseudocysts and remaining 1 patient had a psuedocyst subsequent to trauma.

Young patients were found to be responding better to expectant line of management.

The pseudocysts showed resolution in 7 days – 15 days with a mean of 10.5 days. During this period, patients were placed on antibiotics. Serial USG was used for follow-up every 5 days.

Serum amylase was elevated in 8 of the 9 patients. Serum liver function tests were normal in all patients.

The size of the cysts which showed resolution to the expectant line of management were found to be 5cm and less in maximum diameter with the exception of one psuedocyst of size 6cm which resolved spontaneously. Pseudocysts in the tail and lesser sac which were 4 in number each resolved by expectant line of management while only 1 pseudocyst in the body of the pancreas resolved spontaneously.

USG guided aspiration / Technique:

A total of 18 patients were subjected in this study. Of them 3 were found to be infected and were subjected to surgical intervention by external drainage.

Among the 18 patients, 1 patient had acute pseudocysts. Remaining 4 pseudocysts were found in the background of blunt trauma. Patients with pain who were taken up for aspiration had good improvements in their symptoms.

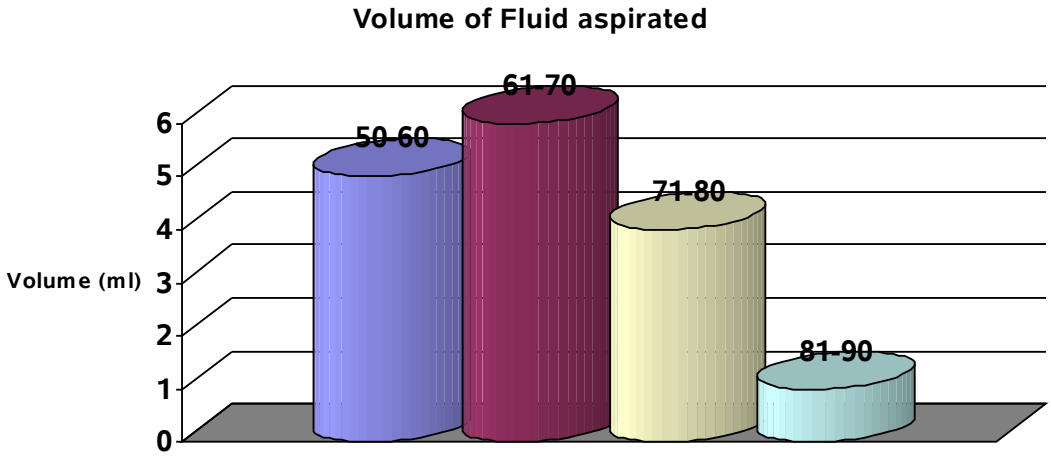
Among the 15 patients who were totally managed with USG guided per-cutaneous technique, 7 patients had pseudocysts in the tail, 6 in the lesser sac and 1 each in the body and head of the pancreas.

Size of the pseudocysts was an important factor determining the success of this treatment modality.

Size (in cms.)	No. of patients
2.1 – 3	6
3.1 – 4	5
4.1 – 5	3
5.1 - 6	1

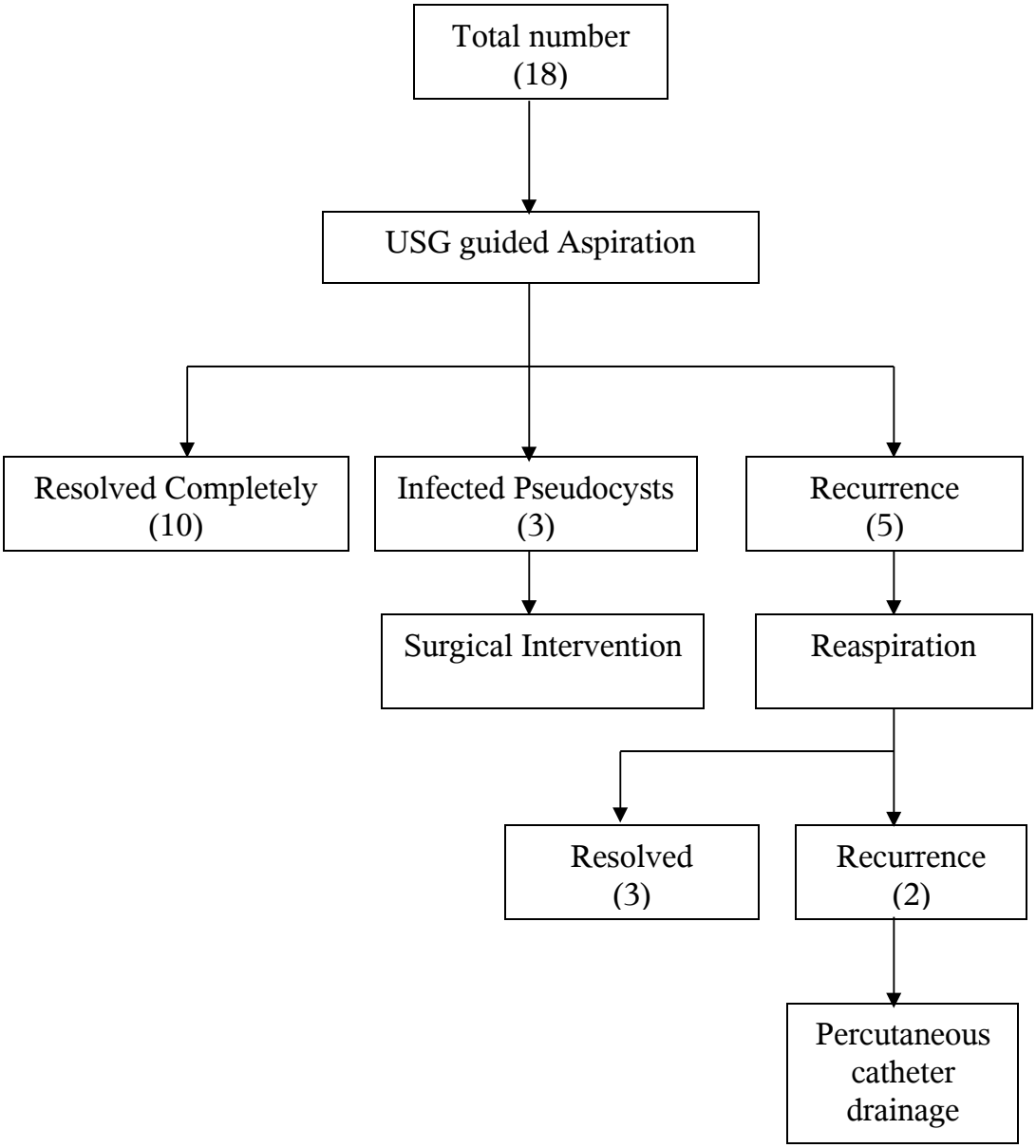
In addition to size, the volume of fluid aspirated is the next factor determining the success of management.

Volume of fluid aspirated (ml)	No. of patients
50 – 60	5
61 – 70	6
71 – 80	4
81 – 90	1



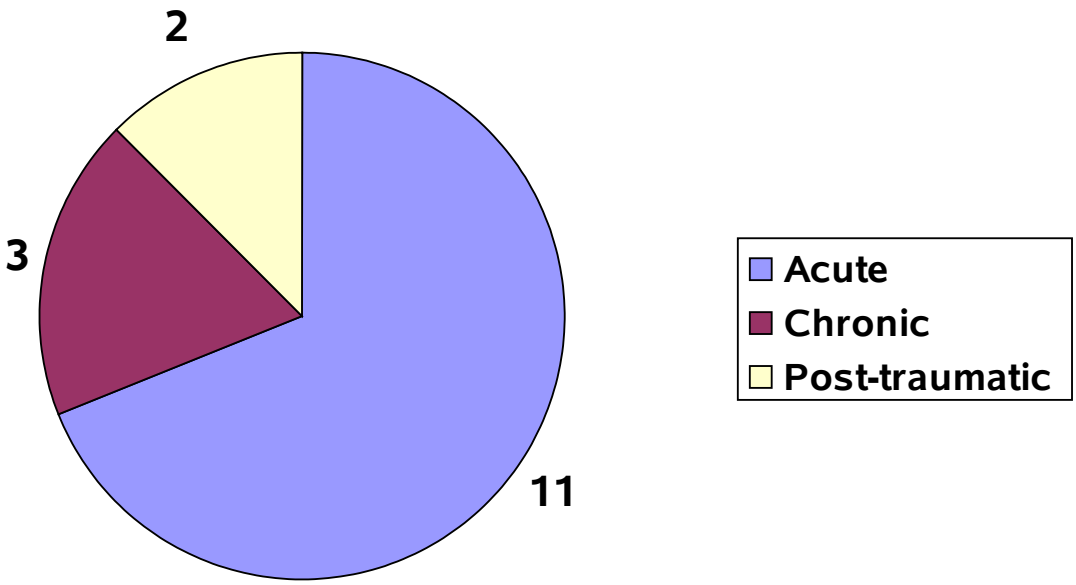
Among the 15 cysts, 3 pseudocysts had to undergo repeat aspiration while 2 among those required repeated aspirations which were subjected to percutaneous catheter drainage. These two catheters were maintained for 7 and 9 days. The algorithm of patients treated by this technique is as shown below.

USG GUIDED PERCUTANEOUS DRAINAGE



Surgery:

A total of 16 subjects had to be intervened surgically. 11 cases of acute pseudocysts, 3 case of chronic pseudocysts and 2 cases of traumatic pseudocysts were encountered.

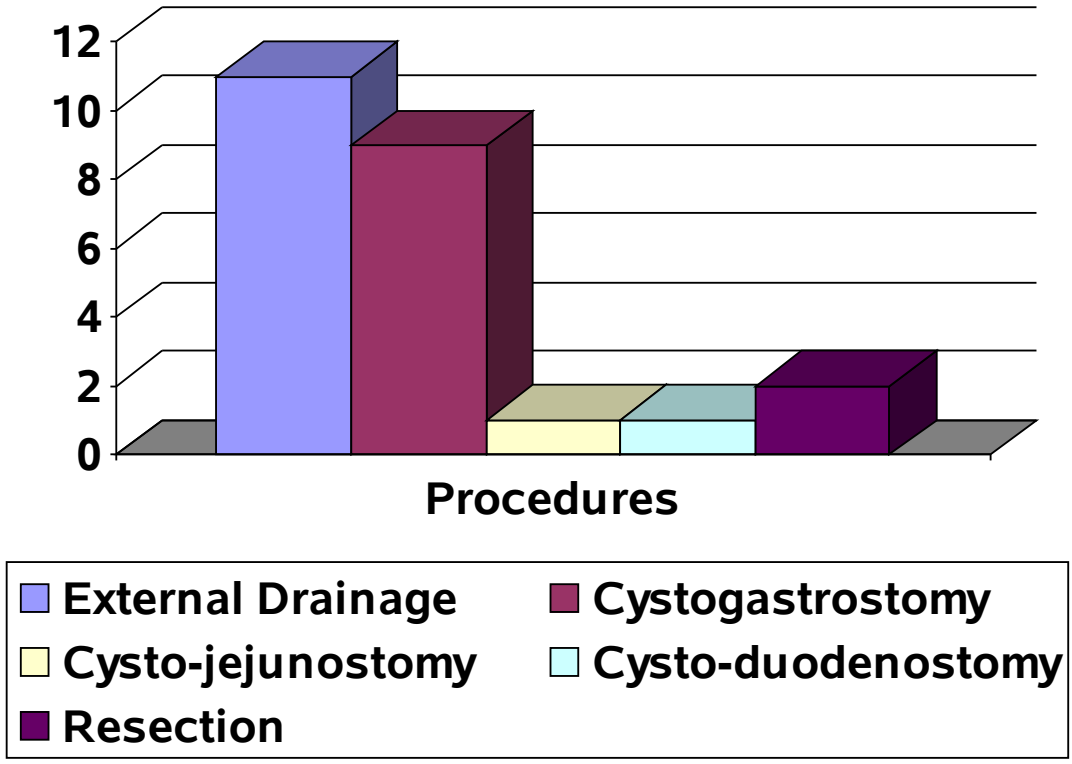


The various locations of pseudocysts that were managed surgically are depicted below:

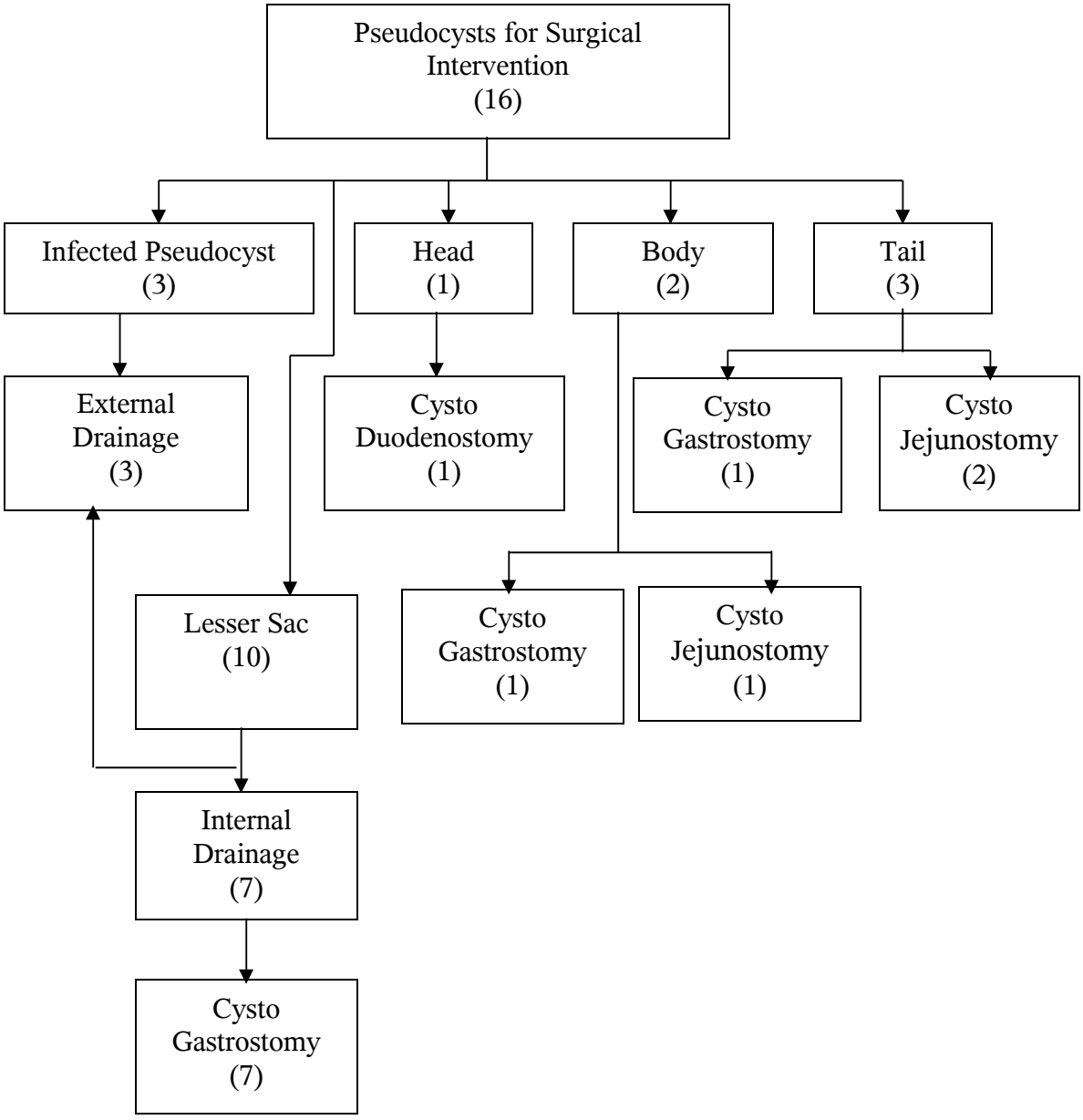
Location	No. of patients
Lesser Sac	10
Tail	3
Body	2
Head	1

The pseudocyst size with greater than or equal to 6cm were the ones which were taken for surgical intervention.

Among the surgical procedures, external drainage was performed in 3 cases, resections in 2 and internal drainage in 11 cases. Of internal drainage, cystogastrostomy was done in 9, cysto-jejunostomy and cysto-duodenostomy in 1 case each. It is the location of the pseudocyst which governs the drainage procedure.



SURGERY


Pseudocysts for Surgical Intervention (16)
Infected Pseudocyst (3)
Head (1)
Body (2)
Tail (3)
External Drainage (3)
Cysto Duodenostomy (1)
Cysto Gastrostomy (1)
Cysto Jejunostomy (2)
Lesser Sac (10)
Cysto Gastrostomy (1)
Cysto Jejunostomy (1)
Internal Drainage (7)
Cysto Gastrostomy (7)

CONCLUSION

The study conducted on these forty patients of pancreatic pseudocysts has revealed the following data:

Pancreatic pseudocysts are a fairly common complication of pancreatitis. Only 2 cases of chronic pancreatitis were encountered. 6 were post-traumatic and the remaining was found to be acute pancreatitis.

Alcohol leads the way in the etiological factor for pancreatitis and its pseudocyst complication.

Pseudocysts are commonly encountered in third to fourth decade of life. A majority of them were following inflammatory etiology. Traumatic pseudocysts were found in the second decade of life in our study.

Males dominated the series, confirming the etiological background of alcohol leading to pancreatitis. (4.55:1)

Epigastric pain was the common clinical presentation seen in 77.5%. Loss of appetite was an invariable feature in a good majority of patients. Abdominal mass and jaundice were reported by a few patients.

USG – Abdomen and CT – Abdomen were both useful in the diagnosis. CT scan was better used for diagnostic purposes and USG served as the tool of follow-up in this series.

About 50% of pseudocysts were located in the lesser sac with the distribution in head, body and tail being 5, 10 and 35 percentage respectively.

While nine pseudocysts were treated and resolved by conservative means, thirty-one had to be intervened. Of those pseudocysts which resolved, they were less than or equal to 5cm and were involving the lesser sac (or) pancreatic tail.

USG – Abdomen in addition to diagnosis has shown in this study to be a good therapeutic option for aspiration. Fifteen pseudocysts resolved by per-cutaneous drainage techniques either aspiration (13) or catheter drainage (2). Aspiration alone has proved to be an effective therapeutic option in centers where ERCP is not used for diagnosis. A good number of patients showed resolution especially relief of pain by this technique.

Among surgical techniques, cystogastrostomy was the most widely used technique. Except for three infected pseudocysts, no other complications were encountered. The series had zero mortality.

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